Patent claims

1. Ceramic material composed of

- a first ceramic material with a perovskite structure as the host lattice, containing

5   lead, zirconium and titanium and

- a second ceramic material with a cryolite structure.

2. Ceramic material per claim 1,

in which the first and the second material form a mixed crystal phase.

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3. Ceramic material per one of claims 1 or 2,

in which the second ceramic material has the general formula

$[A_4(B_{2-2x/3}Nb_{2+2x/3})O_{11+x}V_{1-x}]$, where A stands for barium or strontium and B for

strontium or calcium and V for an oxygen vacancy and where we have for the parameter

15   x: $0 \leq x \leq 1$.

4. Ceramic material per one of claims 1 or 2,

in which the second ceramic material has the summary formula

$[Sr_4(Sr_{2-2x/3}Nb_{2+2x/3})O_{11+x}V_{1-x}]$, where V stands for an oxygen vacancy and where we have

20   for the parameter x: $0 \leq x \leq 1$.

5. Ceramic material per one of claims 1 or 2,

in which the second ceramic material has the summary formula

$Sr_4(Ca_{2-2x/3}Nb_{2+2x/3})O_{11+x}V_{1-x}$, where V stands for an oxygen vacancy and where we have

for the parameter x: $0 \leq x \leq 1$.

5   6. Ceramic material per one of claims 1 or 2,

in which the second ceramic material has the summary formula

$Sr_4(Mg_{2-2x/3}Nb_{2+2x/3})O_{11+x}V_{1-x}$, where V stands for an oxygen vacancy and where we have

for the parameter x: $0 \leq x \leq 1$.

10   7. Ceramic material per one of claims 1 or 2,

in which the second ceramic material has the summary formula

$Ba_4(Sr_{2-2x/3}Nb_{2+2x/3})O_{11+x}V_{1-x}$, where V stands for an oxygen vacancy and where we have

for the parameter x: $0 \leq x \leq 1$.

15   8. Ceramic material per one of claims 1 or 2,

in which the second ceramic material has the summary formula

$Ba_4(Ca_{2-2x/3}Nb_{2+2x/3})O_{11+x}V_{1-x}$, where V stands for an oxygen vacancy and where we have

for the parameter x: $0 \leq x \leq 1$.

20   9. Ceramic material per one of claims 1 or 2,

in which the second ceramic material has the summary formula

$Ba_4(Mg_{2-2x/3}Nb_{2+2x/3})O_{11+x}V_{1-x}$, where V stands for an oxygen vacancy and where we have

for the parameter x: $0 \leq x \leq 1$.

10. Ceramic material per one of claims 1 to 9,

in which the first ceramic material contains a composition of summary formula

$Pb(Zr_aTi_{1-a})O_3$, and where we have for a: $0.5 \leq x \leq 0.6$.

11. Ceramic material per one of claims 1 to 10,

in which the first ceramic material consists of a mixed crystal phase, which is

composed from a PZT ceramic and an added component of the perovskite lattice type.

12. Ceramic material per claim 11,

in which the added component has the summary formula $KNbO_3$.

13. Ceramic material per claim 11,

in which the added component has the summary formula $Pb(M^{II}_{1/3} M^{V}_{2/3})O_3$ and

wherein M^{II} stands for Mg, Zn, Co, Ni, Mn, or Cu and M^{V} for Nb, Ta, or Sb.

14. Ceramic material per claim 11,

in which the added component has the summary formula $Pb(M^{II}_{1/2} M^{VI}_{1/2})O_3$ and

wherein M^{II} stands for Mg, Zn, Co, Ni, Mn, or Cu and M^{VI} for W.

15. Ceramic material per claim 11,

in which the added component has the summary formula $Pb(M^{III}_{1/2} M^{V}_{1/2})O_3$ and

wherein M^{III} stands for Fe, Mn, Cr, or Ga and M^{V} for Nb, Ta, or Sb.

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16. Ceramic material per claim 11,

in which the added component has the summary formula $Pb(M^{III}_{2/3}M^{VI}_{1/3})O_3$ and

wherein M^{III} stands for Fe, Mn, Cr, or Ga and M^{VI} for W).

17. Ceramic material per claim 11,

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in which the added component has the summary formula $Pb(Li^{I}_{1/4}M^{V}_{3/4})O_3$ and

wherein M^{V} stands for Nb, Ta, or Sb.

18. Ceramic material per claim 1 to 17,

in which the ceramic material has the summary formula $A_{1-b-c}B_bC_c$, where: $0 \leq b \leq$

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0.5 and $0 \leq c \leq 0.01$ and wherein

- A stands for the composition $Pb(Zr_aTi_{1-a})O_3$ and $0.5 \leq a \leq 0.6$,

- B stands for an added component of the perovskite lattice type, and

- C stands for a ceramic material of cryolite lattice type.

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19. Ceramic material per claim 18,

which additionally contains also a PbO excess of up to 3 mol. %.

20. Ceramic material per one of claims 1 to 19,

which is free of $KNbO_3$.

5   21. Piezo-actuator

- having a monolithic stack of superimposed piezoelectrical ceramic layers (2) and

electrode layers (3) lying in between, wherein at least one ceramic layer (2) contains a

ceramic material according to one of claims 1 to 19.

10   22. Method for production of a ceramic material per one of claims 1 to 20,

wherein precursor materials of a ceramic material with a cryolite structure are

mixed with precursor materials of a PZT ceramic.

23. Method for production of a ceramic material per one of claims 1 to 20,

15   wherein a previously prepared cryolite phase is mixed with precursor materials of

a PZT ceramic.